What is claimed is:

1. A method of fabricating quantum features from a layer of material, comprising:

forming a first hard mask having at least one elongated structure on the layer;

laterally etching at least one elongated structure of the first hard mask prior to etching the layer;

etching the layer through the first hard mask to form an elongated layer feature; and

removing the first hard mask.

2. The method of claim 1, wherein the layer contains at least one material selected from materials identified in the III-V periodic groups.

3. The method of claim 1 further comprising:

forming a second hard mask on the layer having at least one elongated feature different orientation than the at least one elongated structure of the first head mask;

etching the layer through the second hard mask to form a plurality of quantum dots; and

removing the second hard mask.

4. The method of claim 3 further comprising:

laterally etching the second hard mask prior to etching the layer.

5. The method of claim 3, wherein the elongated structures of first and second hard masks are orthogonally orientated.

6. The method of claim 3 further comprising:

isotropically etching the quantum dots.

7. The method of claim 1, wherein the step of forming the first hard mask further comprises:

forming a first elongated aperture and at least a second elongated aperture formed through the first mask, wherein a distance between the first and second apertures is about 110 nm.

8. The method of claim 3, wherein the step of forming the second hard mask further comprises:

forming a first elongated aperture and at least a second elongated aperture formed through the second mask, wherein a distance between the first and second apertures is about 110 nm.

9. The method of claim 1, wherein the step of forming the first hard mask further comprises:

forming a first elongated aperture having a width of about 60 nm.

10. The method of claim 3, wherein the step of forming the first hard mask further comprises:

forming a first elongated aperture having a width of about 60 nm; and

wherein the step of forming the second hard mask further comprises:

forming a first elongated aperture having a width of about 60 nm and an orientation different than the first elongated aperture of the first hard mask.

11. The method of claim 1, wherein the step of etching further comprises:

providing CF_4 and HBr at a flow ratio CF_4:HBr in a range from 1:20 to 2:1.

12. The method of claim 1, wherein the layer contains at least one material selected from InP, Si-Ge and Si.

13. The method of claim 1 further comprising:

depositing a cladding material on the elongated feature to form an optical device.

14. The method of claim 13, wherein the cladding material is SiO_2.

15. The method of claim 13, wherein the optical device is a laser.

16. The method of claim 13, wherein the optical device is an optical modulator.

17. The method of claim 13, wherein the optical device is an optical detector.

18. The method of claim 1 further comprising:
depositing a cladding material on the elongated feature to form an optical device.

19. The method of claim 18, wherein the cladding is SiO_2.

20. The method of claim 18, wherein the optical device is a laser.

21. The method of claim 18, wherein the optical device is an optical modulator

22. The method of claim 18, wherein the optical device is an optical detector.

23. The method of claim 1, wherein the elongated features are formed in a predefined location.

24. The method of claim 1, wherein the elongated features are formed a predefined pattern.

25. The method of claim 3, wherein the quantom dots are formed in a predefined location.

26. The method of claim 3, wherein the quantom dots are formed a predefined pattern.

27. A method of fabricating quantum dots on a substrate, comprising:
(a) forming on the substrate a film stack comprising a first cap layer, a first hard mask layer, a layer of material selected from materials identified in the III-V periodic groups, and a barrier layer;

(b) forming a first patterned mask having at least one elongated structure from the first hard mask layer;

(c) etching the first cap layer and the first hard mask layer;

(d) laterally etching the first hard mask layer;

(e) removing the first cap layer;

(f) etching the layer of the material of the III-V periodic groups;

(g) removing the first hard mask layer;

(h) depositing a second hard mask layer;

(i) depositing a second cap layer;

(j) forming a second patterned mask having at least one elongated structure disposed in an orientation different than the at least one elongated structure of the first patterned mask;

(k) etching the second cap layer and the second hard mask layer;

(l) laterally etching the second hard mask layer;

(m) removing the second cap layer;

(n) etching the layer of the material of the III-V groups; and

(o) removing the second hard mask layer.

28. The method of claim 27 wherein said cap layers are layers of antireflective coating.

29. The method of claim 27 wherein said cap layers comprise material selected from at least one of an inorganic material, SiON, and SiO_2.

30. The method of claim 27 wherein the said hard mask layers comprise α-carbon.

31. The method of claim 27 wherein the said patterned masks are photoresist masks.

32. The method of claim 27 wherein said elongated structures are substantially parallel straight lines or walls.

33. The method of claim 27 wherein the step (b) further comprises:
trimming the first patterned mask.

34. The method of claim 27 wherein the step (b) further comprises:
providing HBr and O_2 at a flow ratio HBr:O_2 in a range from 1:10 to 10:1.

35. The method of claim 27 wherein the step (c) further comprises:
removing the first patterned mask.

36. The method of claim 27 wherein the step (c) further comprises:
providing CF_4 and Ar at a flow ratio CF_4:Ar in a range from 1:10 to 10:1; and providing HBr and O_2 at a flow ratio HBr:O_2 in a range from 1:2 to 20:1.

37. The method of claim 27 wherein the step (d) further comprises:
providing HBr and O_2 at a flow ratio HBr:O_2 in a range from 1:10 to 10:1.

38. The method of claim 27 wherein the steps (e) and (m) further comprise:
immersing the substrate in a solution comprising at least one of HF, NH_4F, HNO_3, and HCl.

39. The method of claim 27 wherein the steps (e) and (m) further comprise:
providing a solution comprising HF and NH_4F in a volumetric ratio of about 1:6.

40. The method of claim 27 wherein the material of the III-V groups is Si.

41. The method of claim 27 wherein the steps (f) and (n) further comprise:
providing CF_4 and HBr at a flow ratio CF_4:HBr in a range from 1:20 to 2:1.

42. The method of claim 27 wherein the steps (g) and (o) further comprise:
providing HBr and O_2 at a flow ratio HBr:O_2 in a range from 1:10 to 10:1.

43. The method of claim 27 wherein the step (g) further comprises:
immersing the substrate in a solution of HF and deionized water.

44. The method of claim 27 wherein the step (j) further comprises:
trimming the second patterned mask.

45. The method of claim 27 wherein the step (j) further comprises:
providing HBr and O_2 at a flow ratio $HBr:O_2$ in a range from 1:10 to 10:1.

46. The method of claim 27 wherein the step (k) further comprises:
removing the second patterned mask.

47. The method of claim 27 wherein the step (k) further comprises:
providing CF_4 and Ar at a flow ratio $CF_4:Ar$ in a range from 1:10 to 10:1; and
providing HBr and O_2 at a flow ratio $HBr:O_2$ in a range from 1:2 to 20:1.

48. The method of claim 27 wherein the step (o) further comprises
isotropically etching the quantum dots.

49. The method of claim 48 further comprising:
providing CF_4 and HBr at a flow ratio $CF_4:HBr$ in a range from 1:20 to 2:1.

50. The method of claim 27 wherein the step (o) further comprises:
etching the barrier layer.

51. The method of claim 50 further comprising:
immersing the substrate in a solution comprising at least one of HF, NH_4F, HNO_3, and HCl.

52. The method of claim 50 further comprising:
providing a solution comprising HF and NH_4F in a volumetric ratio of about 1:6.

53. The method of claim 27 wherein said elongated structures are walls or lines having smallest widths of about 100 nm or less.

54. The method of claim 27 wherein the quantum dots are structures having topographic dimensions of about 20 nm or less.

55. The method of claim 27 wherein the quantum dots are disposed apart from one another using spaces of about 110 nm or greater.

56. The method of claim 27, wherein the layer contains at least one material selected from InP, Si-Ge and Si.

57. The method of claim 27 further comprising:
depositing a cladding material on the quantum dots to form an optical device.

58. The method of claim 57, wherein the cladding is SiO_2.

59. The method of claim 57, wherein the optical device is a laser.

60. The method of claim 57, wherein the optical device is an optical modulator

61. The method of claim 57, wherein the optical device is an optical detector.

62. The method of claim 27, wherein the quantom dots are formed in a predefined location.

63. The method of claim 27, wherein the quantom dots are formed a predefined pattern.